REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SCOPE OF WORK

CARSON RIVER MERCURY SITE

CHURCHILL AND LYON COUNTY, NEVADA

EPA ID# NVD980813646

PREPARED FOR

ECOLOGY AND ENVIRONMENT
CONTRACT # 68-W9-0020

BY

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SECTION A. INTRODUCTION

SITE DEFINITION

The Carson River Mercury Site (CRMS) consists of: (1) approximately 50-mile stretch of the Carson River in Lyon and Churchill Counties, beginning between Carson City and Dayton, Nevada, and extending downstream through the Lahontan Reservoir to Stillwater National Wildlife Refuge; and (2) tailing piles associated with the drainage system.

SITE HISTORY

Since the discovery of the Comstock Lode in 1859, intense mining activity has occurred near and within the Carson River Basin. Ore mined from the Comstock Lode was transported to any of 75 mills, where it was crushed and mixed with mercury to amalgamate the gold and silver. Large amounts of mercury were imported for milling of the Comstock Lode near Virginia City, Nevada during this period. Of the 75 mill sites, the largest were located along the Carson River in the Brunswick Canyon area due to the availability of water power. The "Washoe Process," as it was called, used 1:10 quicksilver:ore in the amalgamation process. The average loss of quicksilver was 0.68 kg for each ton of ore milled. During the peak of the Comstock Lode (1865-1895) it is estimated that 200,000 flasks of mercury or 6.75×10^6kg (7,500 tons) were lost in the milling process and only 0.5% of that amount was later recovered. Almost 100 years after the Comstock lode, gold is still being recovered from mill tailings using cyanide and flotation methods.

PHYSICAL DESCRIPTION

The Carson River Basin lies in eastern California and western Nevada within the Great Basin physiographic province (Figure 1). The basin comprises in downstream order, five hydrographic areas in Nevada: 1) Carson Valley, 2)Eagle Valley, 3) Dayton Valley, 4) Churchill Valley, and 5) the Carson Desert, totaling 3,365 square miles. The East and West Forks of the Carson River originates in the Eastern Sierra Nevada Mountains, flow through an intricate irrigation system within the Carson Valley and then meet to form the Carson River. The River continues north through Carson Valley, skirting the east side of Eagle Valley, then turns northeast to pass through Brunswick Canyon. Continuing east through Dayton Valley, the river flows into Churchill Valley, site of the Lahontan Reservoir, the main water storage reservoir of the Newlands Irrigation Project. Below Lahontan Dam a complex system of canals and drains facilitate irrigation within the Carson Desert. The river and irrigation return flow ultimately flow northeast to the Stillwater Wildlife Refuge and the Carson Sink, or south to Carson Lake

The topography of the region is a product of Basin and Range extensional faulting, which began about 17 million years ago, creating broad bedrock basins surrounded by high mountains. Subsequent erosion and deposition of the upland areas formed deep

unconsolidated and semi-consolidated basin fill deposits of Tertiary and Quaternary age. Those deposits form the major aquifer in the area, which are stratigraphically complex due to reworking by alluvial and lacustrine processes.

The climate of the River basin is quite dry, a consequence of the rain shadow effect created by the Sierra Nevada Mountains, which form the western boundary of the region. Most precipitation occurs during the winter in the form of snow, which can average 30 inches at higher mountain elevations. Occasional thunderstorms occur during the summer months. Average precipitation in the valleys range from 10 inches in the Carson Valley to 5 inches in the Carson Desert.

Major population centers within the River basin include the municipalities of Minden/Gardnerville, Carson City, Fallon, and associated suburban areas.

The Lahontan Reservoir in Churchill Valley is the main storage reservoir for the Truckee Carson Irrigation District (TCID), and is also a major fishery and recreation site. Truckee and Carson River water is collected here for future use as irrigation water in the Carson Desert.

NATURE OF CONTAMINATION

A 1971 study by the Geological Survey, U.S. Department of Interior, on surface water and sediments from the streams, canals, drains, and lakes in and below Brunswick Canyon reported that substantial amounts of mercury from pre-1900 milling activity had entered the Carson River drainage system. Elevated levels of mercury attributed to the piles were detected in the river from above the Dayton area through the Lahontan Reservoir to the cutoff of the Stillwater Slough, as well as in canyons draining into the Carson River. Total mercury levels as high as 20.0 ppm were reported for bottom-sediment samples collected near the upstream end of Lahontan Reservoir; the highest levels in sediment from the Carson River near Fort Churchill was 11.0 ppm. In 1971, the College of Agriculture Extension Service, University of Nevada conducted a monitoring survey to determine the extent of mercury uptake from corresponding surface water and sediments for seven aquatic species collected from five sampling staions along the watercourse. Total mercury content in fish ranged from 0.02 to 2.72 ppm: highest concentrations occurred in piscivorous white bass (0.50 - 2.72 ppm) sampled from Lahontan reservoir. Residue levels appreared to be related to fish size, as demonstrated by highly significant correlations between wet weight and mercury content of five of the six species. Concentrations also appeared to be directly influenced by the species position on the aquatic food chain. These results indicate that mercury levels in some fish from the Carson River drainage system may exceed the 0.50 ppm maximum concentration considered by the Food and Drug Administration, U.S. Department of Health, Education, and Welfare to be safe for human consumption.

Because the CRMS extends over such a large area, it potentially affects several sources of ground water, among them the Dayton Valley Aquifer. Ground water in the aquifer is as shallow as 10 feet below ground surface near the river, and soils are permeable sands and gravel. These conditions facilitate movement of contaminants into ground water. An estimated 1,400 people obtain drinking water from wells within 3 miles of the site, the nearest within 2,000 feet. However, ground water studies conducted to date do not indicate any trace of mercury contamination.

WORK ASSIGNMENT OBJECTIVES

The purpose of this remedial investigation/feasibility study (RI/FS) is to investigate the nature and extent of contamination at the Carson River Mercury Site and to develop and evaluate remedial alternatives, as appropriate. The contractor will furnish all necessary personnel, materials, and services needed for, or incidental to, performing the RI/FS, except as otherwise specified herein. The contractor will conduct the RI/FS in accordance with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (U.S. EPA, October 1988).

PROJECT TASKS

The specific tasks to be conducted in performing the CRMS RI/FS are separated into the following fourteen tasks:

Task 1: Project Planning/Work Plan (Interim)

Task 2: General Administration/Coordination/Communication (Interim and Ongoing)

Task 3: Community Relations

Task 4: Field Investigations

Task 5: Sample Analysis/Validation

Task 6: Data Evaluation

Task 7: Risk Assessment

Task 8: Treatability Studies

Task 9: Remedial Investigation Report(s)

Task 10: Remedial Alternatives Development and Screening

PROJECT TASKS CONT'D

Task 11: Detailed Analysis of Alternatives

Task 12: Feasibility Study Report(s)

SECTION B. WORK TO BE PERFORMED

TASK 1.0 PROJECT PLANNING

The purpose for this task and the associated subtasks is for the contractor to collect, compile and evaluate all existing data regarding contamination in the Carson River system, develop a conceptual model of the site based on compiled data, and use the conceptual site model to determine the objectives of the remedial investigation and remedial action. The subtasks associated with the project planning phase are as follows:

TASK 1.1 WORK PLAN MEMORANDUM

The purpose of this task is for the contractor to review this statement of work (SOW), develop any questions regarding the task assignments or any other items in this SOW, and meet with the EPA remedial project manager (RPM) within seven days from receipt of the Work Assignment/Statement of Work to review and clarify any questions regarding the contents of this SOW.

The contractor will then prepare a "Work Plan Memorandum" which will be submitted to the EPA RPM, Contracting Officer (CO), and Project Officer (PO). The Work Plan Memorandum will serve as a work plan for the interim tasks assigned in this SOW. The Work Plan Memorandum shall include an overview of the overall objectives of this SOW, an outline of the interim tasks given in this SOW and how the contractor intends to conduct these tasks, and a budget proposal based on the estimated level of effort and staffing required to complete the interim tasks. This document shall include the following elements:

- o Introduction
- o Overview of Statement of Work Objectives
- o Description of Interim Tasks
- o Description of Interim Deliverables
- o Schedule for Interim Tasks
- o Proposed Level of Effort and Costs for Interim Tasks
- o Personnel Plan for Interim Tasks

The contractor will meet with the RPM after the Work Plan Memorandum is reviewed by EPA to discuss any questions or proposed changes to the Work Plan Memorandum.

Deliverables:

- o Work Plan Memorandum

TASK 1.2 COLLECT AND COMPILE EXISTING DATA

The contractor will collect all existing information regarding contamination in the Carson River system for review and compile the information into a site file and a data base. For this task, documents which must be reviewed include but are not limited to the following reports:

Bailey, E.H. and D.A. Phoenix. 1944. Quicksilver deposits in Nevada. Univ. of Nev. Bull. 38:12-46.

Cooper, J.J. 1983. Total mercury in fishes and selected biota in Lahontan Reservoir, Nevada. Bull. Environ. Contam. Toxicol. 31:9-17.

Cooper, J.J., R.O. Thomas, S.M. Reed. December 1985. Total Mercury in Sediment, Water, and Fishes in the Carson River Drainage, West-Central Nevada. Nevada Div. of Environ. Protection Report. 63 pp.

Cooper, J.J., S. Vigg, R.W. Bryce, and R.L. Jacobson. 1983. Limnology of Lahontan Reservoir, Nevada. Bioresources Center Publ. No. 50021. Desert Research Institute, Reno, Nevada. 186 pp.

Cooper, J.J. and S.Vigg. 1984. Extreme mercury concentrations of a striped bass, Morone saxatilis, with a known residence time in Lahontan Reservoir, Nevada. Calif. Fish and Game 70:190-192.

Ekechukwu, G.C.A. 1976. Pharmacokinetics of methyl mercury bioaccumulation in carp, Cyprinus carpio Linnaeus. Unpubl. Ph.D. Dissertation No. 1049. Univ. of Nev., Reno.

Everson, R.A., B.G. Quinn, R.G. Warnock. July 1982. Mercury Contamination of the Carson River and Lahontan Reservoir, Nevada. Unpubl. Ph.D. Dissertation, Westminister College.

Richins, R.T. 1973. Mercury content of aquatic organisms in the Carson River drainage. Unpubl. Masters Thesis. Univ. of Nev., Reno.

Richins, R.T. and A.C. Risser. 1975. Total mercury in water, sediment, and selected aquatic organisms, Carson River, Nevada: 1972. Pest. Monit. J. 9:44-54.

Sevon, M. 1985. Lahontan Reservoir Job Progress Report-1984. Nevada Department of Wildlife. 27 pp.

Smith, G.H. 1943. The history of the Comstock, 1850-1920. University of Nevada Bull. 37:41-47.

Van Denburgh, A.S. 1973. Mercury in the Carson and Truckee

River basins in Nevada. U.S. Geological Survey Open File Report 8 pp. + Appendix.

Any additional information regarding contamination in the Carson River system provided by EPA will also be reviewed, added to the site file, and the data will be included in the data base. This also applies to any additional information obtained by the contractor.

Once the contractor has obtained the available information regarding contamination in the Carson River system, the contractor will create an organized site file and maintain an index of the site file. This index will be amended as new information is added to the file and an updated copy of this index will be provided to the RPM.

The contractor will design a data base which compiles and clearly presents all of the data provided in the above listed reports as well as in any additional reports later identified. The design of this data base and the employed software will be determined at a later date between the contractor and the RPM when the types and quantity of data is better understood.

Deliverables:

- o Site file index
- o Data base

TASK 1.3 DATA ASSESSMENT

The contractor will assess data obtained in Task 1.3 with respect to the QA/QC methods used for sample collection and for sample analysis and determine the quality and applicability of the data. Once the quality of individual measurements are known, the contractor will compile all data points into a cohesive statement which may be used to develop a conceptual site model. Factors that relate to the quality of data and its adequacy for use in the RI/FS process include the following:

- o Age of data
- o Analytical methods used
- o Detection limits of methods
- o QA/QC procedures and documentation

For performing this task, the contractor will develop a procedure to assess data according to a set of criteria also developed by the contractor. The contractor will submit a summary report to EPA describing this data assessment procedure. The contractor will employ this procedure after it is approved by EPA. The EPA guidance entitled "Functional Guidelines for Data Validation, Inorganic Analysis 1985" should be consulted when preparing the data assessment procedures.

Deliverables:

- o Summary report describing the proposed data assessment procedure

- o Data assessment summary report

TASK 1.4 CONDUCT SITE VISIT

The contractor will conduct a site visit in order to better understand the actual scale and physical characteristics of the site before developing a conceptual model. The site visit will provide the contractor an opportunity to note sources of contamination, migration pathways, exposure pathways, receptors, ecological environment, etc. The contractor will coordinate a date for this site visit with the RPM and the designated Nevada representatives.

TASK 1.5 DEVELOP A CONCEPTUAL SITE MODEL

Based on preexisting information obtained for Task 1.3, the site visit, and any additional information, the contractor will develop a conceptual site model. A conceptual model will be an effective representation of the entire known study area and the dynamics of the contaminant(s) within the study area. Information which should provided in the conceptual site model include but is not limited to the following:

- o Identification of all actual and potential sources i.e. location of mills, capacity of mills, milling processes employed, number of years operating, period of operation, etc.

- o Release mechanisms and potential contaminant pathways

- o Spatial distribution of contaminant(s) within the study area according to mercury levels in fish, concentration of mercury in the water column, concentration of mercury in the sediments, soil concentrations in the flood plain, concentrations at sources, concentrations in vegetation, concentrations in ground water, etc.

- o Identification of major sinks of mercury within the study area

- o Speciation of the contaminant(s) within different matrixes throughout the study area

- o Actual and potential human and environmental receptors and the respective exposure pathways

- o Climate of the study area

- o Geomorphology of the study area, i.e. channel migration

- o Surface water hydrology of study area
- o Topography and geology of the study area
- o Identification of private property boundaries throughout the study area and respective land owners

The contractor will meet with the RPM before developing a conceptual site model to propose and discuss a method to effectively represent the conceptual site model. The contractor will develop the conceptual site model after the contractor and the RPM have agreed on a scheme for the model.

Deliverables:

- o Conceptual site model

TASK 1.6 IDENTIFY REMEDIAL ACTION OBJECTIVES AND POTENTIAL REMEDIAL ALTERNATIVES

The contractor will identify the remedial action objectives for each media to be addressed and identify potential remedial alternatives for achieving the remedial action objectives based on the conceptual site model. Remedial action objectives consist of medium or operable-unit specific goals for protecting human health and the environment. Examples of remedial action objectives are source control, reducing concentration of mercury in sediments, reducing concentration of mercury in the water column, reducing the availability of mercury to the foodweb, etc. The remedial action objectives will help determine potential remedial alternatives for the site. This helps to identify the data needs for the remedial investigation and allows for an early determination of the need for treatability studies. The contractor will identify potential technologies based on the remedial alternatives and compile this information into a summary report.

Deliverables :

- o Summary report which proposes remedial action objectives and the respective remedial alternatives .
- o Summary report which identifies potential remedial action technologies

TASK 1.7 IDENTIFICATION OF POTENTIAL ARARs

Contractor will develop a list of potential chemical specific, action specific, and location specific applicable or relevant and appropriate requirements (ARARs) for the site based on the conceptual site model, the remedial action goals and alternatives, and communication with EPA and Nevada agencies. This initial identification of ARARs will be refined as a better understanding is gained of site conditions and remedial action alternatives. Detailed information on identifying and complying with ARARs is

given in the "CERCLA Compliance With Other Laws Manual (Part I-August 1988 and Part II-August 1989, OSWER Directive Nos. 9234.1 and 9234.02).

Deliverables:

- Summary report listing the potential ARARs

TASK 1.8 IDENTIFY INITIAL DATA NEEDS

Based on the conceptual model, the contractor will identify data needs and sampling strategies and a possible remedial investigation. Sufficient data must be obtained to define:

- Physical characteristics of the site
- Physical and chemical characteristics of contaminants sources
- Volume of contamination and extent of migration
- Potential receptors and associated exposure pathways
- Expected performance requirements of treatment alternatives

The information will be used to:

- Determine contaminant fate and transport mechanisms
- Determine the risk posed by the site
- Develop and evaluate remedial alternatives
- Identify ARARs
- Identify the need for treatability studies
- Support future enforcement or cost recovery activities

The contractor will prepare a summary report which identifies data gaps and the proposed strategies for sampling. This report will be submitted to EPA for review and comments.

Deliverables:

- Summary report which identifies data gaps and proposed strategies for sampling.

TASK 1.9 SCOPING REPORT

The contractor will prepare a scoping report which compiles the information provided in the summary reports for Task 1.6, 1.7, and 1.8. This information will include the site background, the conceptual site model, the potential remedial action objectives and alternatives, the potential ARARs, and the contractors proposal for additional site investigations, and the objectives and strategies for these investigations. This report will be submitted to EPA for review and comments. EPA will then conduct a scoping meeting with the contractor and the support agencies to review and discuss the work proposed in the scoping report. If any modifications to the scoping report are requested and agreed upon, the contractor will incorporate these changes and submit a revised draft to EPA. EPA will determine how or if to proceed with the RI/FS based upon the information provided in the scoping report.

TASK 1.10 WORK PLAN

Upon receipt of interim authorization, the contractor shall produce an RI/FS work plan incorporating the concepts from the project planning phase. The work plan will include the following elements:

- Introduction- A general explaination of the reasons for the RI/FS and the expected results or goals of the RI/FS process are presented;

- Site Background and Physical Setting- The current understanding of the physical setting of the CRMS, the history of the CRMS, and the existing information of the CRMS as provided in the Scoping Report;

- Initial Evaluation- The conceptual site model developed in Task 1.6 resented, describing the potential migration and exposure pathways and the preliminary assessment of human health and environmental impacts associated with the current status of the CRMS.

- Work Plan Rationale-Data requirements for the risk assessment, ecological assessment and the alternatives evaluation identified during the formulation of the Data Quality Objectives (DQOs) are documented, and the work plan approach is presented to illustrate how the activities will satisfy data needs.

- RI/FS Tasks- The work plan will describe how the contractor will perform project Tasks 3-12. The level of detail with which specific tasks can be described in the work plan will depend on the amount and quality of existing data. Therefore, in situations in which additional data are needed to adequately scope the development and evaluation of tasks, emphasis should be placed on limiting the level of detail used to describe these subsequent tasks and simply

noting that the scope of these activities will be refined later in the process. As the RI/FS process progresses and a better understanding of the site is gained, these task descriptions can be refined.

- Project schedule, deliverable due dates, and budget estimates for each of the specified RI/FS tasks.

Deliverables:

- Work Plan

TASK 2.0: GENERAL ADMINISTRATION/COORDINATION/COMMUNICATION

Contractor shall perform the following general and administrative tasks required by the ARCS contract:

TASK 2.1: WEEKLY PROGRESS UPDATES

The contractor shall meet on a weekly basis with the EPA RPM, either by phone or in person in order to update project progress, coordinate activities and discuss issues related to the CRMS project. These meetings will generally run 15 minutes to an hour depending on project status. Every month will generally include one of the weekly progress updates in person.

TASK 2.2: MONTHLY PROGRESS REPORTS

The site manager shall prepare monthly progress reports submitted to EPA as required by the ARCS contract. The reports should be of sufficient detail to allow EPA to develop a chronological record of all RI/FS work activities. The monthly reports should highlight any milestones reached or problems encountered or anticipated in the course of the RI/FS activities.

The contractor shall provide a monthly task-by-task breakdown of costs and hours expended for each of the task-specific budgets established in the work plan. A copy of this breakdown shall be sent directly to the RPM and shall show each original task-specific budget, the current charges of dollars and hours to each task, and the balance in each task. This breakdown should include the total amount expended and the balance to date.

The RPM may, through issuance of a Technical Direction Memorandum (TDM), transfer hours or funds from one task sub-budget to another, such that the overall budget of the work assignment remains constant. Upon receiving such a TDM, the contractor shall make the transfer and reflect it on the monthly task-by-task breakdown. The contractor shall not transfer hours or funds from one task sub-budget to another without the approval of the EPA RPM.

In the event that a subcontractor is selected to perform management and work on this work assignment, the same task-by-task reporting shall be required.

Deliverables:

- o Monthly progress reports

TASK 2.3: TECHNICAL CONTACTS MAILING LIST:

The Contractor shall maintain a list of current address for all agengies and representatives associated with the CRMS RI/FS. The RPM will assist in identifying parties that occasionally or regularly need to be informed of various activities concerning the RI/FS activities at CRMS.

Deliverables:

- o Mailing list of project contacts

TASK 3.0: COMMUNITY RELATIONS

Community relations will remain EPA's responsibility. However, upon EPA's request the contractor will be required to provide personnel, services, materials, and equipment to assist EPA in undertaking a community relations program. The contractor will provide the following assistance upon the request of EPA:

- o Prepare a community relations plan for the CRMS project;
- o Write, print, and distribute a remedial investigation fact sheet.
- o Assist the RPM at public meetings.

The guidelines for preparing a community relations plan are in the EPA guidance entitiled "Community Relations in Superfund: A Handbook (June 1988, OSWER Directive No. 9230.0-3B)."

Deliverables:

- o Community relations plan
- o RI Fact Sheet

TASK 5: FIELD INVESTIGATIONS

Field investigations will proceed only after approval of the work plan by the contracting officer and will follow the plans developed in the SAP and QAPP. The contractor will then conduct those investigations necessary to characterize the site and to evaluate the actual or potential risk to human health and the environment posed by the site. Investigation activities will focus on problem definition and will result in data of adequate techni-

cal content to evaluate potential risks and to support the development and evaluation of remedial alternatives during the FS.

Field investigation tasks will require a quality assurance project plan (QAPP), a sampling and analysis plan (SAP), and a health and safety plan (HSP). These reports can only address remedial investigation tasks which were developed in Task 1.9 and therefore include an approved sample and analysis strategy and established DQOs. The scope of any additional activities will include the data quality objectives (DQOs) and the corresponding quality control protocols. For developing the QAPP and SAP, the following guidance should be consulted and adhered to:

U.S. EPA Region IX Guidance for Preparing Quality Assurance Project Plan for Superfund Remedial Projects, September 1989

Preparation of a U.S. EPA Region IX Sampling Plan for EPA Lead Superfund Projects, April 1989

U.S. EPA Region IX SAS Methods Compedium, October 1989

The contractor will develop a HSP on the basis of site conditions to protect the surrounding community and personnel involved in site activities. The plan should address all applicable regulatory requirements. The plan should provide a site background discussion and describe personnel responsibilities, protective equipment, health and safety procedures and protocols, decontamination procedures, personnel training, and type and extent of medical surveillance. The plan should identify problems or hazards that may be encountered and how these are to be addressed. Procedures for protecting third parties, such as visitors or the surrounding community, should also be provided. Standard operating procedures for ensuring worker safety should be referenced and not duplicated in the HSP.

TASK 5.0: SAMPLE ANALYSIS/VALIDATION

The contractor will choose the type of laboratory(ies) to analyze the field investigations samples. The type of laboratory may include a mobile laboratory, a laboratory with whom EPA has contracted under the contract laboratory program, (CLP), or a non-CLP laboratory. The type of laboratory selected will depend on the analytical services required, the data quality objectives, and the desired turnaround time.

The contractor will develop a data management system following the approved QAPP. This system will include field logs, sample management and tracking procedures, and document control and inventory procedures for both laboratory data and field measurements to ensure that the data collected during the investigation are of adequate quality and quantity to support the risk assess-

ment and the FS. All records should be maintained throughout the RI/FS to ensure that only final and approved analytical data are used in the site analyses.

TASK 6.0: DATA EVALUATION

The contractor will refine the conceptual site model developed in Task 1.6 with the site investigation data. Based on the more detailed and complete site model, the contractor will reevaluate the extent of contamination, sources of contamination, transport mechanisms, exposure pathways, the human health and ecological risks, remedial action alternatives, and ARARs. The contractor will prepare a Data Evaluation report which presents the site investigation data and summarizes the changes to the conceptual model.

Deliverables;

- o Summary report of site data and conclusions

TASK 7.0: RISK ASSESSMENT

The contractor shall conduct a baseline risk assessment (RA) to assess the potential human health and environmental risks posed by the site in the absence of any remedial action. This effort will involve the following four components:

Contaminant Identification

The contractor will review available information on the hazardous substances present at the site and identify the major contaminants of concern. Contaminants of concern should be selected based on their intrinsic toxicological properties because they are present in large quantities, and/or because they are currently in, or potentially may migrate into, critical exposure pathways, i.e, food chain.

Exposure Assessment

The contractor will identify actual or potential exposure pathways, characterize potentially exposed populations, and evaluate the actual or potential extent of exposure.

Toxicity Assessment

The contractor will provide a toxicity assessment of those chemical found to be of concern during site investigation activities. This will involve an assessment of the types of adverse effects health or environmental effects associated with chemical exposures and adverse effects, and the related uncertainties for contaminant toxicity, i.e., weight of evidence for chemical's carcinogenicity.

Risk Characterization

The contractor will integrate information developed during the exposure and toxicity assessments to characterize the current or potential risk to human health and/or the environment posed by the site. This characterization should identify the potential for adverse health or environmental effects for the chemicals of concern and identify any uncertainties associated with contaminant(s), toxicity(ies), and/or exposure assumptions.

Deliverables:

- o Risk Assessment

TASK 8.0: TREATABILITY STUDIES

The contractor will conduct bench and/or pilot studies as necessary to determine the suitability of remedial technologies to site conditions and problems. Technologies that may be suitable to the site should be identified as early as possible to determine whether there is a need to conduct treatability studies to better estimate costs and performance capabilities. Should treatability studies be determined to be necessary, a testing plan identifying the types and goals of the studies, the level of effort needed, a schedule for completion, and the data management guidelines should be submitted to EPA for review and approval. Upon EPA approval, a test facility and any necessary equipment, vendors, and analytical services will be procured by the contractor.

Upon completion of the testing, the contractor will evaluate the results to assess the technologies with respect to the goals identified in the test plan. A report summarizing the testing program and its results will be submitted by the contractor and presented in the final RI/FS report. The contractor will implement all management and QC review activities for this task.

Deliverables:

- o Summary report of treatment technologies

TASK 9.0: REMEDIAL INVESTIGATION REPORT

Upon completion of Tasks 3-8 which will be detailed in the approved Work Plan, a draft of the remedial investigation report will be prepared and submitted to EPA. The suggested RI Report format is given in the October 1988 CERCLA Guidance for Conducting a RI/FS. The report will present all findings of the site characterization and an assessment of the level of any risks posed by these findings. Supporting data and information will be included in the appendices of the report. Once comments on the draft RI report are received, a final RI report will be prepared.

Deliverables:

- o Remedial investigation report

TASK 10: REMEDIAL ALTERNATIVES DEVELOPMENT AND SCREENING

In an effort to produce the final FS report, the contractor will develop a range of distict, hazardous waste management alternatives that will remediate or control mercury contaminated media (soil, surface water, sediments, etc.) remaining at the CRMS, as deemed necessary in the RI, to provide adequate protection of human health and the environment. The potential alternatives should encompass, as appropriate, a range of alternatives in which treatment is used to reduce the toxicity, mobility, or volume of wastes but vary in the degree to which long-term management of residuals or untreated waste is required, one or more alternatives involving containment with little or no treatment; and a no-action alternative. Alternatives that involve minimal effort to reduce potential exposures, i.e., site fencing and deed restrictions, should be presented as "limited action" alternatives.

The following steps will be conducted during the RI, to determine the appropriate range of alternatives for this site:

Establish remedial action objectives and general response actions based on existing information, site-specific remedial action objectives to protect human health and the environment should be developed. The objectives should specify the contaminant(s), and an acceptable contaminant level or range of levels for each exposure route, i.e., preliminary remediation goals. Preliminary remediation goals should be established based on readily available information or chemical specific ARARs. As more information is collected during the RI, the contractor, in consultation with EPA, will refine remedial action objectives as appropriate.

General response actions will be developed for each medium of interest to satisfy remedial action objectives. Volumes or areas of media to which general response actions may apply shall be identified, taking into account requirements for protectiveness as identified in the remedial action objectives and the chemical and physical characteristics of the site.

Based on the developed general response actions, treatment technologies should be identified and screened to ensure that only those technologies applicable to contaminants present, their physical matrix, and other site characteristics will be considered. This screening will be based primarily on a technology's ability to effectively address the contaminants at the site, but will also take into account a technology's implementability and cost. The contractor will select representative process options, as appropriate, to carry forward into alternative development. The contractor will identify the need for treatability testing (Task 8) for those technologies that are probably condidates for consideration during the detailed analysis.

The potential technologies and process options will be combined into media-specific or site wide alternatives. The developed alternatives should be defined with respect to size and configuration of the representative process options; time of remediation, rates of flow or treatment; spatial requirements; distances for disposal; required permits, imposed limitations, and other factors necessary to evaluate the alternatives.

If many distinct, viable options are available and developed, a screening of alternatives will be conducted to limit the number of alternatives that undergo the detailed analysis and to provide consideration of the most promising process options. The alternatives should be screened on a general basis with respect to their effectiveness, implementability, and cost. The contractor will meet with EPA to discuss which alternatives will be evaluated in the detailed analysis and to facilitate the identification of action-specific ARARs.

TASK 11: DETAILED ANALYSIS OF ALTERNATIVES

Leading to the FS report the contractor will conduct a detailed analysis of alternatives which will consist of any individual and a comparative analysis of all options against the evaluation criteria with respect to one another. The evaluation criteria are as follows:

Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs addressses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provide grounds for invoking a waiver.

Long-term Effectiveness and Permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume Through Treatment is the anticipated performance of the treatment technologies a remedy may employ.

Short-term Effectiveness address the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

Cost includes estimated capital, operation, maintenance, and net present worth costs.

State Acceptance (Support Agency) addresses the technical or administrative issues and concerns the support agency may have regarding each alternative.

Community Acceptance addresses the issues and concerns the public may have to each of the alternatives.

The individual analysis should include: (1) a technical description of each alternative that outlines the waste management strategy involved and identifies the ARARs associated with each alternative; and (2) a discussion that profiles the performance of that alternative with respect to each of the evaluation criterion. A table summarizing the results of this analysis should be prepared. Once the individual analysis is complete, the alternatives will be compared an contrasted to one another with respect to each of the evaluation criterion. The detailed analysis of alternatives will be included with the feasibility study.

TASK 13: FEASIBILITY STUDY REPORT

The contractor will present the results of Tasks 11 and 12 in a FS report. Support data, information, and calculations will be included in appendixes to the report. The contractor will prepare and submit a draft FS report to the EPA for review. Once comments on the draft FS have been received, the contractor will prepare a a final FS report reflecting the comments. Copies of the final report will be made and distributed to those individuals identified by the EPA.

Deliverables:

- Feasibility study report

SECTION C. SUMMARY OF DELIVERABLES

The deliverables that are identified in this statement of work are as follows:

- Work Plan Memorandum
- Site File Index
- Data Base
- Summary Report: Data Assessment Procedures

- o Summary Report: Data Assessment
- o Conceptual Site Model
- o Summary Report: Remedial Action Objectives and Alternatives
- o Summary Report: Potential ARARs
- o Summary Report: Data Gaps and Sampling Strategies
- o Scoping Report
- o Work Plan
- o Monthly Progress Reports
- o Technical Contacts Mailing List
- o Quality Assurance Project Plan
- o Sampling and Analysis Plan(s)
- o Community Relations Plan
- o Remedial Investigation Fact Sheet
- o Summary Report: Data Evaluation
- o Risk Assessment
- o Summary Report: Treatment Technologies
- o Remedial Investigation Report
- o Feasibility Study Report

SECTION D. PROJECT SCHEDULE

The following list of interim deliverables and respective time for submittal pertain only to the interim tasks. The approved Work Plan will contain a detailed description of all subsequent tasks, dates for deliverables, and assigned budget. The interim deliverables and the allotted time for submittal following approval of the statement of work are as follows:

DELIVERABLE	**DUE DATE**
Work Plan Memorandum	2 weeks after SOW approval
Site File Index	4 weeks " " "
Data Base	12 weeks " " "
Summary Report: Data Assessment Procedure(s)	6 weeks " " "

Summary Report: Data Assessment	12 weeks	"	"	"
Conceptual Site Model	14 weeks	"	"	"
Summary Report: Remedial Action Objectives and Alternatives	16 weeks	"	"	"
Summary Report: Potential ARARs	16 weeks	"	"	"
Summary Report: Data Gaps and Sampling Strategies	16 weeks	"	"	"
Scoping Report	18 weeks	"	"	"
Work Plan	22 weeks	"	"	"